CLAIMS

WHAT IS CLAIMED IS:

1. A method for the linearization of frequency-modulated continuous wave (FMCW) radar devices having a non-linear, ramp shaped, modulated transmitter frequency progression x(t) comprising the steps of:

correcting a phase term on a receiver side of a FMCW radar device said correction for compensating a phase error in a reception signal q(t).

2. The method as in claim 1, wherein said step for correcting a phase term comprises the following steps:

selecting a number (L) of consecutive ramp-shaped reception sequences $q_k(n)$ of the reception signal, wherein said number can be predetermined with k=1,...,L;

representing a set of phases $\arg\{q_k(n)\}$ which can be represented as a polynomial of an N^{th} order for a time index n, with a polynomial coefficient m_ℓ, with $\ell=1,...,N$,;

transforming a spectrum range $Q(e^{j\Omega})$ of the selected reception sequences q(n) into a basic band that can be predetermined, wherein a set of basic band reception sequences $\hat{q}_k(n)$ with k=0,…,L-1 are generated in each instance;

iteratively calculating a correction phase term for partial compensation of non-linear frequency components in said basic band of reception sequences $\hat{q}_k(n)$ by calculating a set of polynomial coefficients $\tilde{m}_{\ell,k}^{(i)}$ of the individual basic band reception sequences $\hat{q}_k(n)$ via estimation methods, wherein $\hat{q}_k(n)$ are the sequences that have already been iteratively phase corrected, wherein said iteration is stopped once a parameter change between two consecutive iterations, which can be predetermined, remains below a threshold ε which can be predetermined.

3. The method as in claim 2, wherein said step of calculating polynomial coefficients, includes using said formula $\tilde{m}_{\ell,k}^{(i)}$ which includes estimating a distance $\tilde{R}_k^{(i)}$ between a radar device emitting a transmission signal x(t) and an object reflecting a transmission signal x(t).

4. The method as in claim 2, wherein said step of iteratively calculating a correlation phase term comprises the steps of:

calculating an individual discrete Fourier transformation $\hat{Q}_k^{(i)}(\mu)$ of the basic band reception sequences $\hat{q}_k^{(i)}(n)$ whereby $\hat{Q}_k^{(i)}(u) = FFT\{\hat{q}_k^{(i)}(n)\}$ for k=1,...,L

calculating filtered basic band reception sequences $\bar{q}_k^i(\mu)$ by means of a band pass filter according to $\bar{Q}_k^{(i)}(\mu) = w(\mu)\hat{Q}_k^{(i)}(\mu)$ wherein w(μ) is a spectrum window that can be predetermined and indicates a range of a spectrum window

having a μ_{max} that can be predetermined wherein $\mu \in [\mu_\mu, \mu_l]$ with a low limit μ_u that can be predetermined and an upper limit μ_l that can be predetermined;

calculating an individual inverse Fourier transformation $\bar{q}_k^{(i)}(n)$ of a filtered basic band reception sequence $\bar{Q}_k^{(i)}(\mu)$ wherein $\bar{q}_k^{(i)} n = IFFT\{\bar{Q}_k^{(i)}(\mu)\}$ for k=1,...., L;

estimating at least one distance $\tilde{R}_k^{(i)}$ by means of a maximum likelihood estimation method;

calculating a polynomial coefficient $\tilde{m}_{\ell,k}^{(i)}$ from the estimated distances $\tilde{R}_k^{(i)}$;

averaging of said polynomial coefficient $\tilde{m}_{\ell,k}^{(i)}$ with ℓ=1,..., N over L reception sequences $\hat{q}_k$ with k=1,..., L;

averaging a set of distances $\overline{R}_k^{(i)}$ over L reception sequences $\hat{q}_k(n)$;

calculating the reception sequences $\hat{q}_k^{(i+1)}(n)$ with the averaged, estimated polynomial coefficients $\widetilde{m}_\ell^{(i)}$ as the starting point for the next iteration.

5. The method as in claim 1, wherein said iteration step is stopped upon reaching a predetermined number of iteration steps.

6. The method as in claim 4, wherein said iteration step is stopped if a condition $\left|R^{(i-1)} - R^{(i)}\right| < \varepsilon$ is reached with ε being a threshold that can be predetermined.

7. The method as in claim 6, further comprising the step of calculating a set of final estimate values $\widetilde{R}, \widetilde{m}_\ell$ via the following formula $\widetilde{R} = R^{(i)}; \widetilde{m}_\ell = \frac{1}{\widetilde{R}^{(i)}} \sum_{i=1}^{I} \widetilde{R}^{(i)} \widetilde{m}_\ell^{(i)}$.

8. The method as in claim 5, wherein said spectrum window is a rectangular window or a Hamming window.

9. The method as in claim 5, wherein a position of a center point μ_{max} of a spectrum window corresponds to a maximum amount of FFT $\left|\hat{Q}_k^{(i)}(\mu)\right|$ generated by averaging of an amount FFT of a basic band reception sequence $\left|\hat{Q}^{(i)}(\mu_{\max})\right|$ over a number L.

10. The method as in claim 1, wherein said reception signal is mixed with said transmission frequency into a lower frequency position that can be predetermined.

11. The method as in claim 1, wherein after said step of basic band transformation, the method further comprises the step of reducing a scanning cycle T_A of a ramp signal $q_k(n)$, wherein the ramp signals $q_k(n)$ are filtered by means of an Antialias low-pass.

12. The method as in claim 11, wherein said factor K, reduced by scanning cycle T_A, lies between K=30 and K=60.

13. The method as in claim 5, wherein said number of iterations can be predetermined, between 10 and 20 iterations.